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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/676,645

10/01/2003

Gyung-Su Cho

OPP-GZ-2007-0009-US-00

7874

36872

7590

04/01/2008

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EXAMINER

NADAV, ORI

ART UNIT

PAPER NUMBER

2811

MAIL DATE

DELIVERY MODE

04/01/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/676,645	<b>Applicant(s)</b> CHO, GYUNG-SU	
	<b>Examiner</b> Ori Nadav	<b>Art Unit</b> 2811	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 February 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,4,5,8,22-24,27-32 and 34-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4,5,8,22-24,27-32 and 34-37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 4-5, 8, 22-24, 27-32 and 34-37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claimed limitation of a “the alloy”, as recited in claim 1, is unclear as to whether “the alloy” is “the alloy layer” or a different element.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4-5, 23-24, 27-32 and 34-37, as best understood, are rejected under 35 U.S.C. 102(e) as being anticipated by Matsubara (6,890,852).

Matsubara teaches in figure 1 and related text a semiconductor device comprising:

a via within an insulation layer 16 over a metal line (located within semiconductor substrate 1);

a barrier metal layer 6 on a surface of the via;

a copper layer 9 on the barrier metal layer within the via, the copper layer having vertical side surfaces that contact the barrier metal layer; and

an alloy layer 10 (column 10, lines 20-22) on an upper surface of the copper layer within the via, the alloy having a top surface that is coplanar with or lower than a top surface of the insulation layer, wherein vertical side surfaces of the alloy layer contact (make electrical contact) the barrier metal layer, and the alloy layer consists essentially of copper and a low melting point metal selected from the group consisting of aluminum, lead, and silver, wherein

the thickness of the alloy layer is less than a thickness of the copper layer, wherein

a protection layer 26 (see figure 12) comprising silicon nitride or silicon oxynitride over the copper layer except for the portion of the copper layer within the via, wherein

the barrier metal comprises a metal selected from the group consisting of Ti, Ta, TiN, and TaN, and having a thickness between 200 and 800Å

an insulation layer 101 comprises oxide over the semiconductor device, wherein the via is within the insulation layer, wherein

the barrier metal layer prevents the diffusion of copper from the copper layer into the insulating layer, wherein

the alloy layer is completely within the via and exposed through an opening in the protection layer, wherein

the barrier metal layer covers all surfaces of the via and contacts the insulating layer, and

wherein a thickness of the alloy layer being less than a thickness of the metal line.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 and 22, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsubara in view of Liu et al. (6,638,867).

Regarding claims 5 and 22, Matsubara teaches in figure 1 and related text substantially the entire claimed structure, as applied to claim 1 above, except a width of the bonding pad is less than a width of via.

Liu et al. teach in figure 2 and related text a width of the bonding pad 24 is less than a width of via.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a width of the bonding pad being less than a width of via in Matsubara's device in order to reduce the size of the device.

### ***Response to Arguments***

Applicant argues that Matsubara does not teach thick copper layer 10 and thin copper layer 9 formed of different materials.

Claim 1 recites a bonding pad comprising a copper layer and a copper alloy layer. The broad recitation of the claim does not require that the copper layer and the alloy layer comprise different materials, since the copper layer can include additional materials therein.

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues that Matsubara does not teach a metal line consisting essentially of copper in the via over the barrier metal layer having vertical side surfaces that contact the barrier metal layer.

Matsubara teaches a metal line 9 consisting essentially of copper in the via over the barrier metal layer having vertical side surfaces that making electrical contact with the barrier metal layer 6.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ori Nadav whose telephone number is 571-272-1660. The examiner can normally be reached between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Gurley can be reached on 571-272-4670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

O.N.  
3/31/2008

/ORI NADAV/  
PRIMARY EXAMINER  
TECHNOLOGY CENTER 2800